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THE AGRICULTURAL STUDENT

OHIO STATE UNIVERSITY, COLUMBUS, OHIO

MARCH 1916

HORTICULTURAL ISSUE

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Back Again in 1915

ARNETT ROSE
ALGER, OHIO

DEWEY HANES
ARCANUM, OHIO

CORN CHAMPIONS

Arnett Rose,
Alger, Ohio
Boys' Ohio Champion
153.9 bushels per acre.
Used Swift's Fertilizer

Roy Friedersdorf,
Elizabethtown, Ind.
Boys' Ind. Champion.
128.8 bushels per acre.
Used Swift's Fertilizer

Norris McHenry,
Elizabethtown, Ind.
Men's Ind. Champion
112.1 bushels per acre.
Used Swift's Fertilizer

Harold Doster,
Mayfield, Ohio
Cuyahoga County
Champion
92.2 bushels per acre.
Used Swift's Fertilizer

Sherman Magaw,
Edinburg, Ind.
Highest 10-ear Score
103.4 bushels per acre.
Used Swift's Fertilizer

G. W. Thompson,
Letts, Ind.
2nd Prize Bartholomew
County Contest
104.2 bushels per acre.
Used Swift's Fertilizer

1914

Get Posted on What Produces Champions and Farm Profits

Pointers From Hanes' Farm Results 1915

From regular corn field, acre yield - - **75.0 bu.**
No fertilizer used

From his brothers' Ohio Corn Contest Acre **123.0 bu.**
Used 500 lbs. Fertilizer (**not Swift's**) containing only Phosphoric Acid and Potash

From Dewey Hanes' Ohio Corn Contest Acre **153.7 bu.**
Used 500 lbs. **Swift's Fertilizer** containing **Ammonia, Phosphoric Acid** and **Potash**

The difference in the yield of the two boys was due entirely to the kind and brand of fertilizer used. Stop buying phosphoric acid and potash and straight acid phosphate because they are cheap. Use a well-balanced fertilizer containing ammonia, phosphoric acid and potash and get maximum yields and profits.

Still More Proof

Norris McHenry, Indiana State Champion, 1914, had two 5-acre plots. Note the results:

One plot **112.1** bushels per acre. Used **Swift's Fertilizer.**
One plot **93.1** bushels per acre. Used fertilizer, but **not Swift's.**
The kind of fertilizer used is alone responsible for the difference in yields.

Further arguments are unnecessary.
Swift's Fertilizers are proved the best.
Swift's Fertilizers make the farmer the most net profit.

Order Swift's Fertilizer from your local dealer **today.**
If unable to obtain it ask us prices, terms and literature.
We want live agents in unoccupied territory.

Swift & Company

Fertilizer Works

Society for Savings Bldg. Dept. F. Cleveland

CORN CHAMPIONS

Dewey Hanes,
Arcanum, Ohio
Boys' Ohio Champion
153.7 bushels per acre.
Used Swift's Fertilizer

Gordon Reap,
Elizabethtown, Ind.
Bartholomew County
Champion
105 7 bushels per acre.
Used Swift's Ferti'izer

Harry Isaac,
Sandusky, Ohio
Huron County
Champion
126.0 bushels per acre.
Used Swift's Fertilizer

Robert Wilson,
Casner, Ill.
Macon County
Champion
94.0 bushels per acre.
Used Swift's Fertilizer

Fred C. Karr,
Coshocton, Ohio
Coshocton County
Champion
94.0 bushels per acre.
Used Swift's Fertilizer

Chester Davis,
Jonesboro, Indiana
Grant County
Champion
81.0 bushels per acre.
Used Swift's Fertilizer

1915

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THE
AGRICULTURAL STUDENT

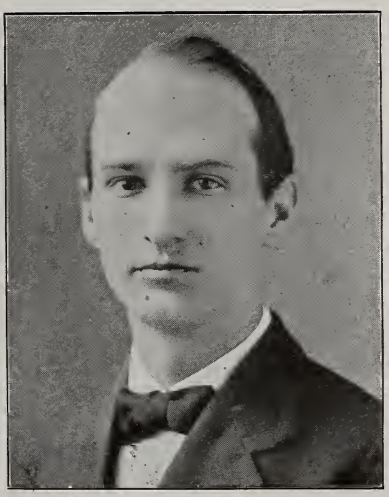
Vol. XXII. OHIO STATE UNIVERSITY, COLUMBUS, MARCH, 1916 *No. 7*

FACTORS AFFECTING REGULAR BEARING IN ORCHARDS

Results of Experiments at the New Hampshire Experiment Station in Plot Tests of Fruit Trees with Fertilizers, Cultivation, Mulching, Liming and Cover Crops; Effect of Girdling and Pollination

JOSEPH E. GOURLEY, New Hampshire College of Agriculture, Durham, N. H.

WE face a complicated problem when we attempt to discuss the factors which influence regular bearing in the apple orchard. Often we have become over-enthusiastic over some one factor and neglected some others which are equally important. For instance, why go to the expense of using orchard heaters in an orchard poorly cared for in other particulars, or thin fruit and neglect to spray?



If we are going to produce good fruit we should first grow a good tree. For this I think we have scriptural warrant: — first the blade, then the ear, then the full corn in the ear.

Before we can have fruit formed it is obviously necessary to have fruit buds formed, and I desire to spend a major portion of the article discussing some of the factors which influence their formation.

In the first place we might state that in the beginning the wood or branch bud and the fruit bud are identical, and it is only later in their development that a change takes place that causes a fruit bud to be formed from the branch bud. We speak of simple and mixed buds, meaning trees which produce the leaves and blossoms in separate buds, as the peach, and those which produce both leaves and blossoms in the same bud, as the apple.

Location of Fruit Buds.

While it is not always possible to distinguish between the fruit and branch bud on all kinds of trees, yet such a knowledge of the gross anatomy of the tree as will teach us where we can expect the fruit buds to appear is fundamental to good pruning and should represent the A, B, C's of that art.

While the normal location for fruit buds on the apple is a terminal bud on a spur, yet other positions are not uncommon. We all realize that different varieties of apples have different forms of fruit branches, for instance the Sutton and Wagener set their fruit on short spurs along the branches, the Willow Twig on the terminus of long, slender branches of the previous year's growth, while the Roxbury Russet produces short jointed spurs of many years growth,

and other types might be cited. Also we find more than one of these types on the same variety and same tree.

In the far West it is quite common for the fruit buds to be axillary in the apple, but there seems to be an impression that this never occurred in the East. Observation, however, will not bear out this assumption, for we find it quite common in the climate of southern New Hampshire, and in fact we have observed it in many sections of the East and with many varieties.

Another point of interest is the fact that a spur may develop an apple and also form a new fruit bud the same season, thus making it an annual bearing spur rather than a biennial one. This is not the usual procedure with many varieties, however.

Time of Fruit Bud Formation.

It is quite important that we realize the approximate time of fruit bud formation, as some of the orchard practices should be regulated with this idea in mind. Probably every fruit grower knows that the fruit buds are formed the season previous to their expanding. This fact seems to have been observed many years ago, as the older literature makes mention of it. But since all buds have their beginning as branch or leaf buds, it is not easy for the growers to know just when the differentiation of branch and flower buds begin. In fact, a microscopic examination is necessary.

It has been determined by careful research that the fruit bud begins to differentiate from the branch bud about July 1, and it continues over a period of a number of days following this, depending on the variety and weather conditions. It so happens that this is about the time that wood growth stops on mature trees, and we associate these two facts together, namely, that the energies of the tree are used up until that time in making the vegetative increase of growth, and afterward the energies go to the formation of fruit buds and maturing the wood and fruit.

While that is the normal time for the flower buds to form, it is also found that they may, and often do, form a second growth in our orchards during the latter part of the summer, and we sometimes find a fruit bud on the terminus of this second growth. So we may have two periods of fruit-bud formation, early in July and in the fall, but doubtless the normal time and the largest number are formed at the early period.

Factors Involved.

We must next look at the causes which favor or cause the branch buds to develop into flower buds. And here we must recognize two general causes: first, inherent causes; second, external causes.

Every variety of fruit has its own fixed characteristics by which it is recognized, as size, color, shape, etc., and it also has such characters as season of ripening, age at which it comes into bearing, heavy or light bearing habit, annual or alternate bearing, etc. The inherent character of bearing fruit varies in degree with different varieties, and indeed with individuals within a variety, but in the main it is well fixed. That is, we say it is the nature of the variety to bear only in alternate years or to bear heavy crops, etc.

We must recognize that some varieties whose habit it is to bear a crop of fruit every year, or at least alternate a heavy with a light crop, do not live up to their reputation, but lag behind because of external causes which affect them. And it is our purpose here to mention methods which will often correct this trouble and also affect or modify to some degree such varieties

as have strongly marked inherent characters. Or, in other words, how shall we bring about regular bearing in our orchards?

Soil Treatment Affects Yields.

To determine some of the factors which influence the formation of fruit buds, the New Hampshire Experiment Station has been conducting for the past eight years an experiment in a seven-acre Baldwin apple orchard, which was about twentyfive years old when leased. This orchard had been standing in sod for a number of years and the hay cut and removed. The results of this work are an object lesson in orchard renovation, as well as giving us some information on the main project.

Treatment of Orchard.

Crimson clover is used as a cover crop in every case. Seed is sown July 10 at the rate of 20 pounds per plot. In seeding plots 2 and 3 the following mixture is used: 10 pounds timothy; 10 pounds red clover; 5 pounds white Dutch clover.

Plot 1—Sod. To remain permanently in sod. Grass to be mown when inconveniently long and allowed to remain on the ground. No fertilizer to be applied.

Plot 2—Cultivated the odd year, cover crop sown July 10, seeded the even. No fertilizer is applied.

Plot 3—Cultivated the even year, cover crop sown July 10, seeded the odd. No fertilizer is applied.

Plot 4—Clean cultivation. This plot is plowed every spring and cultivated every two weeks until September 1. No cover crop is sown and no fertilizer is applied.

Plot 5—Cultivation and cover crop. This is plowed every spring and cultivated every two weeks. A cover crop consisting of 20 pounds of crimson clover is then sown. No fertilizer is applied.

Plot 6—Cultivation and cover crop, with the following complete fertilizer per tree: 2 pounds nitrate of soda; 4 pounds sulphate of potash; 7 pounds basic slag.

Plot 7—Cultivation and cover crop, with the following complete fertilizer per tree: 2 pounds nitrate of soda; 4 pounds sulphate of potash; 8½ pounds acid phosphate.

Plot 8—Excess Phosphorus. Cultivation and cover crop, with the following complete fertilizer per tree: 2 pounds nitrate of soda; 4 pounds sulphate of potash; 17 pounds acid phosphate.

Plot 9—Excess Nitrogen. Cultivation and cover crop, with the following fertilizer per tree: 6 pounds nitrate of soda; 4 pounds sulphate of potash; 8½ pounds acid phosphate.

Plot 10—Excess Potassium. Cultivation and cover crop, with the following complete fertilizer per tree; 2 pounds nitrate of soda; 10 pounds sulphate of potash; 8½ pounds acid phosphate.

Plot 11—Limed. A portion of plots 7, 8, 9 asd 10 receive 20 pounds slaked lime per tree in addition to the fertilizer treatments.

Plots 12—This plot crosses plots 7, 8, 9 and 10 and serves as a check on Plot 1.

The results from these various treatments it would seem that we can expect ments have shown in a marked way the beneficial effects of cultivation, but have shown, as yet, no marked gain from the use of fertilizers. In this respect our results are in line with most of the experiments which have been conducted by others. It is well here to note, however, that no sod mulch treatment is included in this work and no fertilizer treatments have been made on sod orchards. From our observa-

a ready response from fertilizer on a sod orchard, and usually they should be used when no cultivation is given.

The following table gives the results as secured for the past six years from the orchard in question:

AVERAGE ANNUAL YIELD OF APPLES PER TREE

Summary of Plots.

Year	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7	Plot 8	Plot 9	Plot 10	Plot 11	Plot 12
1908	467	167	118	105	77	67	67	59	106	124	....	....
1909	95	67	101	106	80	56	71	78	90	28	....	....
1910	481	1248	2315	1859	2381	1842	2027	1736	1738	2038	2373	2011
1911	795	701	154	549	99	248	131	185	164	94	30	129
1912	376	749	1232	2105	2162	2038	2046	1631	1530	1284	1245	1473
1914	270	708	1724	2859	2737	2989	2611	2132	2963	2738	2346	2854
Average	414	607	940	1264	1256	1207	1159	970	1098	1051	999	911

From the above table we see that the trees growing in sod have produced on the average the lowest yield, and hence the smallest number of fruit buds in the experiments. Next in importance are plots 2 and 3, which are cultivated every year, while the plot (No. 4) which annually receives clean culture throughout the season, averages a trifle higher for the six years recorded than any other plot. Cultivation with a cover crop ranks practically the same, the trees in both plots producing about as many fruit buds as the bearing surface will permit. The fertilizer plots have not surpassed plots 4 and 5 in yield or growth, and we cannot say, up to the present, the addition of a complete fertilizer has increased fruit-bud formation to a greater extent than a good system of culture without their use.

On the whole, this orchard has been gradually increasing in yield in the off years. This fact shows the beneficial effect of a good system of culture. No other factor studied in this experiment has so affected the yield as cultivation annually and the use of a leguminous cover crop. The fact that such a notorious biennial bearer has yielded to the treatment and is now not only bearing very heavy crops during its "bearing" years, but is also increasing notably during the off year, shows what can be expected from cultivation. This should be a striking lesson to the man who has a run-down orchard standing in grass.

To study more closely the results of the above treatments it should be mentioned that an abundance of stored food in the twigs and branches is essential to the abundant formation of fruit buds. That is, when for any reason a tree uses up all its energies during the growing season, it is not likely to form many fruit buds for the ensuing year. This fact is noted in case a tree makes a rapid and rank growth throughout the season. In such a case we often find the tree yielding little or no fruit. Also when a tree overbears it is commonly followed by a lean year, when the tree apparently makes good the drain of the previous season. So our orchard management should be such as to avoid excesses on the part of the trees, and thereby assist in bringing about regular bearings.

Abundant sunlight seems to be necessary for fruit formation also, as evidenced by the results on thick, unpruned trees. Usually only the outer branches form fruit buds and the interior of the tree is barren. Keeping a reasonably open tree by regular pruning will insure heavier yields.

Leaf Surface Important.

Another fact which should be understood by the fruit grower is the importance of maintaining a healthy leaf surface on the tree. When there is a reduced leaf area from any cause the amounts of food material elaborated will be reduced, and when such injury amounts to considerable it may reduce the number of fruit buds formed by decreasing the amount of food available for storage in the branches. We find, on the average, that the year a tree bears a heavy crop of fruit the total leaf area of the tree is reduced. When a tree is not bearing the leaves are usually larger and they can manufacture and lay up a reserve of food and bring about the formation of fruit buds.

In two trees which were being studied with this point in mind, we found the following differences in leaf area:

LEAVES TAKEN AUGUST 20, 1913, AND JUNE 23, 1914.
Average Weight and Area Per Leaf.

Sample.		Air Dry Wt. in Grams.	Area in Squre Inches	Average Difference in Area Square Inches
Bearing Trees	1913	.2535	4.7320	
	1914	.2010	5.1633	
Non-bearing Trees	1913	.4226	7.0584	2.0802
	1914	.3150	6.9972	

In the whole seven acre orchard of Baldwins we found a considerable difference between the bearing and off years, although considerable fruit was produced in the off year. The average leaf area in square inches in 1913 (off year) for the entire orchard was 5.11 square inches, and for 1914 (bearing year) it was 3.80 square inches. Here we find an average difference of nearly an inch and a half in area per leaf for the entire orchard between a year when only a partial crop is borne and the consecutive year when a heavy crop is produced. This lesson shows the advantage of careful spraying to avoid injury from fungus and insect troubles.

Ringing and Girdling.

Mechanical injury is sometimes resorted to in order to bring trees or individual branches into bearing. This is accomplished by obstructing the flow of elaborated food in its downward course from the leaves, and thus cause a piling up or excessive storage of food about the buds and in the branches. Such a result would be accomplished if a narrow strip of bark were removed from the trunk or branch of a tree. A similar result would be accomplished by twisting a branch to such a degree as to mutilate the tissue and thus check the flow of sap. Sometimes we find a wire label has not been removed from the young nursery tree, and occasionally we find the buds on such a branch flowering when the remainder of the tree does not form fruit buds for several years.

Dwarfing trees is resorted to by grafting on a slow growing stock, the object being, among other things, to bring the trees into earlier bearing. Recent investigations, however, show that little is gained in earlier bearing by the

dwarfing process, and the advantage of dwarf trees must be sought in something else than earlier bearing.

Pollination.

A discussion of regular bearing in orchards would not be complete without making some reference to the question of pollination. We have learned in recent years that certain varieties of fruits are not fertile to their own pollen, but need pollen from some other varieties in close proximity, so that insects may carry the pollen from one blossom to another and thus insure a full setting of fruit. Not only are some varieties self-sterile, but they are also inter-sterile with some varieties. In fact, it is usually considered that all pome and drupe fruits are more fertile and produce better specimens of fruit when standing in an orchard of mixed varieties than when standing alone. To be sure, not every case of the non-setting of fruit is due to sterility of the variety, but may be due to such causes as too great vigor of the trees, thus causing a severe June drop. Also insects and diseases play their part in preventing regular bearing in the orchard, as well as rains, snows, freezes and other climatic factors. But many times the continuous poor setting of fruit has been traced to lack of proper fertilization, due to self-sterility, and this constitutes a new problem to be faced and thoroughly considered by every planter of orchard fruits.

And to sum up the factors which we have mentioned as affecting the regular bearing of apple orchards, the following are of paramount importance: Some cultural treatment which maintains an ample supply of food, together with abundant moisture and humus; moderate but regular pruning to stimulate fruit spur formation and keep them vigorous without pushing all the buds into woody growth, as well as maintaining ample light throughout the trees; thorough and consistent spraying to insure a healthy foliage for manufacturing abundant food material; and the mixing of varieties and presence of bees in the orchard to insure pollination.

SOME COMMON FRUIT BUDS
(a) Pear; (b) Apple; (c) Peach; (d) Cherry; (e) Plum; (f) Apricot.

GRASS MULCH CULTURE OF APPLE ORCHARDS

How Extra Profits Are Made by the Use of Fertilizers

F. H. BALLOU, Assistant Horticulturist, Ohio Agricultural Experiment Station

PROBABLY the first discussion before the horticulturists of Ohio, of the "sod-mulch" plan of apple orchard culture was that of the veteran apple grower, F. P. Vergoin, of Delaware, Ohio, who delivered an address on apple culture at the thirty-fifth annual meeting of the Ohio State Horticultural Society, at Lancaster, in December, 1901. cussed in various horticultural papers and magazines. Horticultural writers and instructors guardedly commended the scheme as practical and sensible, while others, without trial, sympathy, patience or even a clear understanding of details involved, condemned it as contrary to all safe, sane and acceptable principles of cultural practice.

Increased yield of apples per row due to the application of 5 pounds nitrate of soda, 5 pounds of acid phosphate and 2½ pounds of potash per tree. Taken from experimental plots of the Ohio Agricultural Experiment Station in Southern Ohio.

In 1903 Prof. W. J. Green, horticulturist of the Ohio Experimental Station, also presented a paper on the subject of mulching apple orchards, at the thirty-seventh annual meeting of the society, at Delaware, basing his statements on the success being attained by Mr. Vergoin, and by Grant Hitchings of New York. During the interim between these discussions, and following, the idea of mulching as a plan of apple orchard culture, was quite freely dis-

The original plan of mulching was to retain the orchard area in sod and to mow once or twice each season the grass growth. The grass to be raked, divided and spread in broad, circular bands beneath the outer extremities of the branches of the trees. The chief source of mulch material, however, was straw or other vegetable matter hauled into the orchard from other parts of the same farm, or purchased from neighboring farms. The additional mulch ma-

terial from outside sources was added to that obtained by clipping the grass growing in the orchard—all being concentrated beneath the circular spread of branches of the trees. This plan was, and is, commendable for agricultural sections where orchards are not numerous; where the land is fairly fertile; where grain is largely grown, straw abundant, convenient to procure and low in price.

In the year of 1910 the Ohio Experiment Station began a series of experiments in southeastern Ohio, for the purpose of determining what could be done to encourage rejuvenation of the many apple orchards which, located on the long-farmed, over-cropped, thin, poor hill-slopes, were merely existing in a half-starving, sterile condition. Cultivation of these steep hills was not to be considered; for through several generations of farm crop production during which no special thought or care was given to rotation of crops, maintenance of plant food and humus, or even to conservation of the soil itself erosion had claimed a heavy toll from the productive resources of the land. Naturally, under these circumstances, having been favorably impressed with the plan, practice and results in central and northern Ohio, the sod-mulch method of orchard culture was the one and only one that seemed applicable to the rugged, hilly orchard areas of this part of the state; and a number of tests were started, in which mulching and the use of chemical fertilizers were to figure prominently.

These first experiments in mulching with straw, in southeastern Ohio, were continued for three seasons, but were discouraging from the beginning. Clearly the land would prove far too expensive in the hilly areas of the southern part of the state where soil is thin, poor and lifeless; where grain and forage are grown in but a small way, and where straw and other vegetable matter for mulching purposes is not only extremely scarce but inconvenient and difficult to transport over the rough hilly roads. At the outset our station was forced to pay $7 per ton for loose straw. This new demand for a commodity of great scarcity at once gave an upward slant to the price and straw advanced to $10. One season we were obliged to pay $15 per ton. The price constantly has been prohibitive in recent years, averaging close to $10—

Fifth season's product of mulch material from 18 tree-squares of space; unfertilized. Composition: Field daisies, golden-rod, white-weed and poverty grass.

baled straw only being available much of the time.

The scheme of mulching previously had received many hard knocks from those who had opposed and ridiculed it as a method; but no argument against the plan had ever been so damaging and effective as was the extremely high price of straw. Unfortunately, too, there seemed to be no obtainable substitute. All forms of roughage were scarce. The hilly farms under prevailing practices in handling yielded barely enough forage for the farm livestock, and the waste land, because of extreme soil poverty, was covered with only a thin, scattering growth of mixed weeds and poverty grass. In fact the mulch method where mulching seemed to be the only practical means of solving the problem of caring for apple orchards on the rough land, apparently had encountered an obstacle which doomed it to abandonment. Not so. A day of revelation was at hand.

In planning the combined mulching and chemical fertilizer experiments the mulched and unmulched plots crossed the fertilized and unfertilized plots at right angles. The plan gave a comparison of results of applying chemical plant food both with and without a mulch, on the thin sod of mixed weeds and poverty grass. The standard formula of chemicals for orchards 15 to 20 years of age was 5 pounds each of nitrate of soda and acid phosphate and 2½ pounds of nitrate of potash, per tree, whether applied separately or in combination. Where the trees were mulched the plant food was scattered on the mulch; where unmulched it was sown over corresponding circular areas about the trees directly on the thin sod of wild growths. Prompt and remarkably fruitful results were obtained wherever nitrate of soda as the source of nitrogen, either alone or in mixture with other elements of plant food, was applied either with or without the mulch of straw. Other plots left unmulched and unfertilized for comparison remained lacking in vigor and productiveness.

Fifth season's product of mulch material from 18 tree-squares of space, each square fertilized with 5 pounds of nitrate of soda, 5 pounds of acid-phosphate and 2½ pounds of muriate of potash per year. Composition: Timothy, redtop, bluegrass, and orchard grass.

During the three years that mulching with straw was continued, the plots both mulched and fertilized did not prove more vigorous or fruitful than the plots which were fertilized without mulching. Nor was this result one that could be interpreted to mean that mulching exerted no beneficial influ-

ence. For surprising developments had quickly appeared where the nitrogenous applications had been applied around the trees on the formerly thin sod of weeds, and poverty grass. Rank growths of rich. dark green timothy, redtop and bluegrass had voluntarily sprung up on the circular areas fertilized beneath and about the trees, where nitrate of soda had been used; and the bulk and weight of this mixed growth of the better grasses which so quickly replaced the weedy and worthless growth formerly existing, so closely approximated the bulk and weight of straw used as a mulch about the trees in the competitive plots that when annually clipped with the mowed early in June and allowed to remain where it fell when cut, constituted a soil covering or mulch almost if not quite equal to that of straw.

Here, then, was suggested an easy, practical, economical solution of the source of mulch material for the thin orchard soils of the hilly sections of southeastern Ohio. The course of procedure was rendered clear; to slightly increase the quality of chemical plant food and apply it evenly over the entire orchard area excepting small spaces immediately about the bases of the trees. By this plan the trees would not only continue in increased vigor and fruitfulness, but the vegetation of the orchard. beneath and between the trees, would be so transformed and increased that an abundance of mulch material would be grown exactly where needed—the annual production of vegetation to be clipped in June and September and permitted to lie as a soil covering or mulch over the entire surface of the ground.

This plan of "grass-mulch" culture of orchards—far more radical than the original one of the "sod-mulch" where straw from outside sources is the chief dependence for mulching material, is now in practical operation in a number of our experiment station's test plots in southeastern Ohio, and is giving most excellent results. Formerly starved. dwarfed and practically sterile apple orchards now under the chemical grass-mulch treatment are not only healthy and vigorous but abundantly fruitful, while the orchard land which, at the outset. supported but a scant, wild growth of native weeds and poverty grass, is now thickly set with the better grasses which, anually cut and allowed to remain as a soil covering, is rapidly blanketing the gradually improving soil with a covering of decayed and decaying vegetable matter. No grass seed has been sown in any of these experiments.

The transformation from a thin, wild, weedy soil covering to one composed of thickly-set, more valuable grasses, wrought by the use of chemical elements of plant food in conjunction with the reconstructive forces of nature, constitute one of the most interesting and valuable object lessons ever developed in our experiment station work in orchard reclamation. However, there is no element of mystery involved; for among the sparse, weedy vegetation of long-neglected orchard areas (and farm land as well) there can here and there be found. on close inspection, small, weak, discouraged. merely-existing plants of the more valuable species of grasses and legumes. So inconspicuous are these tiny plants that none but close observers would ever notice them; yet when the particular elements of plant food on which these more valuable plants thrive are applied to the soil, they at once spring into growth and multiply and thicken and take possession of the ground to the practical exclusion or crowding-out of the former weedy growths.

A remarkably suggestive, interesting and valuable development of results in the use of chemical plant foods as surface applications in the new "grass-mulch" plan of apple orchard culture is the fact that nitrate of soda as the promptly available source of nitrogen, is not only the chief factor in promoting increased vigor and fruitfulness of the trees, but also in the quick transformation of the vegetation of the orchard area from thinly scattered wild growths to thickly-set timothy, redtop and bluegrass. And that acid phosphate as the most quickly available source of phosphorus, when used alone, apparently exerts no effect on the vigor or fruitfulness of the trees, and but little if any effect on the small, weak, inconspicuous plants of the grasses just named, but becomes directly responsible for a gradual development of and an eventual luxuriant occupation of the ground by clover—white or red, or mixed. However, where a liberal application of nitrate of soda (perhaps in excess of 200 pounds per acre) is used in combination or mixture with acid phosphate the nitrate seems to overbalance the peculiar properties of the phosphate in clover encouragement, with the result that the grasses will smother or crowd out the clover.

A lesson of unusual significance and value therefore becomes available for our utilization; that nitrate of soda and acid phosphate may be applied separately—the nitrate around the trees in a circle slightly larger than the spread of the branches. and the acid phosphate over the remainder of the space between the rows. This will not only affect prompt results in the form of increased vigor and fruitfulness of the trees, but a gradual occupation of the ground between the rows by clover. Results of present experiments indicate that as the clover (red) comes and is utilized as a mulch, the nitrogen it leaves in its decaying roots, in turn, not only stimulates the grasses to follow in natural rotation, but that the trees will at this time benefit by the nitrate of the clover to such an extent that the quantity of nitrate of soda anually applied immediately around the trees may be materially lessened. Further progress of these experiments promises results and data of unusual interest and significance.

Fifth season's product of mulch material from 18 tree-squares of space, each fertilized with 5 pounds of acid phosphate and 2½ pounds of muriate of potash per year. Composition: Red clover.

TOP GRAFTING OF APPLE TREES

Simple Methods of Utilizing Undesirable Varieties

J. B. KEIL, Ohio Agricultural Experiment Station, Wooster, Ohio

MANY effects of top grafting apple trees have been ascribed to the influence of stock upon scion, or scion upon stock. Much of the discussion along this line has been based on conjecture, and the effects observed may have been the result of any one of a dozen other causes.

At the Ohio Agricultural Experiment Station orchards are planted with trees from "everywhere."

Many new varieties were introduced which seem likely to be adapted to Ohio conditions, or varieties of such promise with respect to quality as to warrant their trial in the state. Among these we find a number of trees untrue to name, others showing a distinct lack of adaptation to our length of season, and still others without the degree of quality necessary to successfully compete with the established varieties of the same season. When these trees are sufficiently vigorous and healthy to make good stocks, they are used for top-grafting to other new varieties.

The accompanying illustrations were reproduced from photographs taken in the station orchard during the season of 1915. The tree shown was nine years from planting when the grafting was done. The views show the newly set grafts, and a season's growth of the same. It should be borne in mind that the growing season of 1915 was an exceptionally good one for trees, and such growth could not be expected to take place in a year of average rainfall. The twigs used for scions are cut when fully dormant, choosing twigs of the previous year's growth from vigorous, healthy branches. A diameter of 1-8 or 1-4 inch is desirable. The twigs should be stored where they will remain

Newly Set Grafts on Nine-Year-Old Tree—Ohio Agricultural Experiment Station

dormant, and be easily kept moist. Some moist sand on the earth floor of a cool cellar is an ideal place.

Grafting may be done during a comparatively long period in the spring, provided the scions can be kept dormant. If one wishes to endure the discomfort of working in the trees in cold weather, and the inconvenience of keeping the wax warm by artificial heat, grafting may be done by setting the scions several weeks before growth begins. A bright, sunshiny day with the temperature at 60 or 70 degrees, after the first leaves have begun to unfold, is an ideal time for this work. The standard grafting wax is most easily handled at this temperature.

The ordinary 9 or 10-year-old tree which has been well trained will have a number of branches sufficiently large in size for cleft grafting. It will also have a number of unimportant side branches which may be left to take up some of the excess sap from the disproportionately large root system. These also furnish shade for the main branches and trunk, which prevents sunscald.

Same Tree as Shown on Opposite Page with One Year's Growth

A branch of 1¼ to 1½ inches in diameter is most desirable for cleft grafting. Larger branches may be used by splitting twice across the stub and seting four scions. Smaller branches, down to ½-inch, may be used, but are often found to be too weak after splitting to give sufficient pressure to hold the scion firmly in place.

If only small branches or twigs are available, as when grafting a 2 or 3-year-old tree, the whip-graft may be used, with strips of waxed cloth for covering. In this style of grafting it is desirable that the stock and scion be as nearly as possible the same diameter. In case they are not, it is sufficient to insert the scion properly at one side of the stock, so that the cambium layers or growing portions of each are in contact.

The scions are often of various sizes. In such cases the larger scions should be used for the larger cleft-grafts, since they will bear the heavier pressure more safely than a small scion, which might be crushed in such a place. The scions may be 4 to 6 inches in length, but if it is necessary to make the supply reach as far as possible, two sound buds to a scion will suffice. Terminal buds should be removed, as they are often fruit-buds, which develop at the expense of leaf growth.

The three methods of grafting shown in the third illustration are sufficient for all practical top-grafting on apple trees. The cleft-graft is used for all branches of suitable size. The whip-graft is used for small twigs, and the side-graft where large branches must be shaded with new growth.

The operator should always bear in mind the essential point in all grafting —that is, the cambium layers of stock and scion must be placed in contact or no union will take place. This contact is assured in cleft-grafting by setting the scion rather low in the cleft, and giving it a definite outward slant, so that the cambium layers in crossing give contact at four points on each scion. This principle must be observed in all forms of grafting, and once this is thoroughly understood grafting becomes a simple operation. A little practice in shaping the scions will soon show the operator the proper way to prepare the scions for the various stocks. A sharp, smooth-cutting knife is essential.

The main function of the covering of grafting wax is to prevent the cut surfaces from excessive drying. In cases of the whip-graft the strip of grafting cloth or tape serves also to hold the scion securely in place. Only a thin covering of wax is needed. Some grafters use liquid or melted wax applied with a brush.

The standard formula is 4 pounds rosin, 2 pounds beeswax, 1 pound tallow. Melt together until thoroughly mixed, then pour into a vessel of cold water. Grease the hands with tallow, and when the wax is cool enough to handle, take it up, and pull it like taffy until it becomes light in color and perfectly smooth. Shape into sticks or balls, and lay on oiled paper to harden. The substitution of paraffine for beeswax gives a little harder wax, less sticky in warm weather, as well as less expensive in cost of materials.

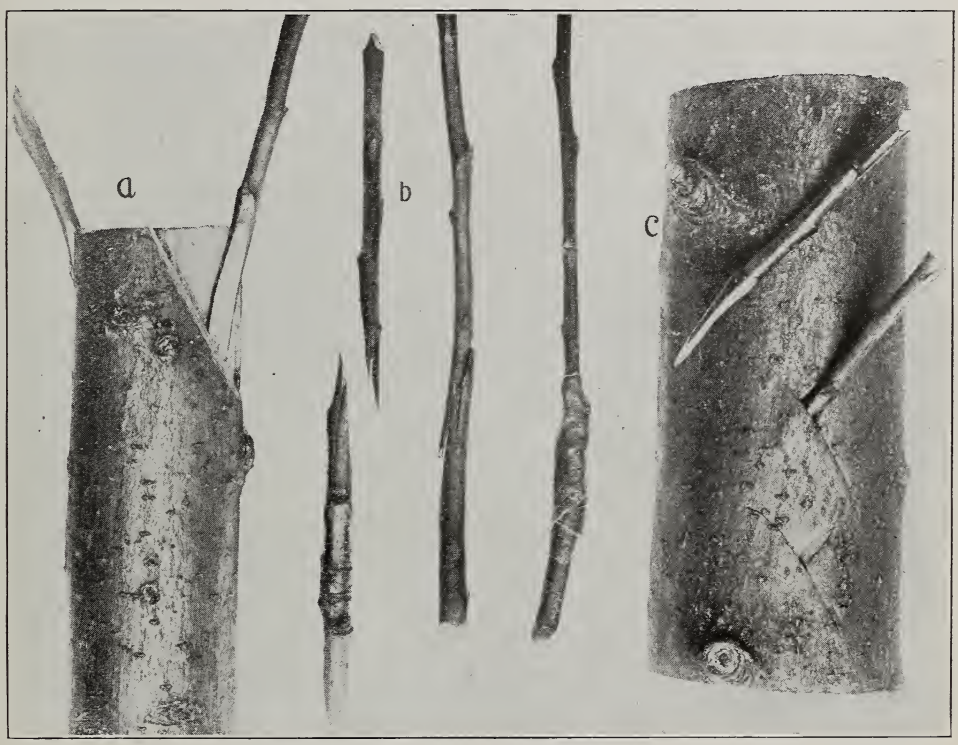
The grafting tape is made by tearing into ¾-inch strips some old, well-worn muslin, rolling neatly into rolls about 2½ inches in diameter, and soaking for a few minutes in melted grafting wax, which should be near the boiling point. A little "kink" which greatly facilitates the unrolling of the tape, is to place the end of each strip of cloth as it is rolled over the beginning of the succeeding strip. In unrolling, the tape may then be removed in a continuous strip.

The tools required are a pruning saw, shears, a sharp knife, grafting tool, and a mallet or short heavy club. A box in which to carry the tools, with bail and hook for hanging in the tree. If the regular grafting tool is not available, a heavy butcher knife may be used

to split the stubs and a small cold chisel as a wedge to open the cleft while inserting the scions.

The time required for the grafts to come to fruit-bearing depends almost entirely upon the variety used. Some grafts at the Ohio station orchard set in 1912 fruited lightly in the third season from grafting, and heavily in the fourth. Others set at the same time have not yet produced fruit.

the most promising one should be favored by the gradual pruning of the weaker one, leaving only enough growth to help heal over the stub, after which it may be removed entirely. The stronger graft should be treated as a branch of the tree. It is well to go over the trees several times during the first summer and remove the watersprouts, and perhaps some of the excessive growth of the branches not grafted.



How Grafts Are Made

Top-grafting is at best an expensive operation, when one considers the time required. It should not be attempted on old, diseased trees. When trees known to be susceptible to fire blight are to be grafted, only varieties of known resisting power should be used.

The care given the grafting trees after the scions have started into growth should be noted. Where two scions are set in a stub, and both grow, Some nipping back of the new shoots on the grafts will prevent the formation of long, top-heavy twigs which might be broken off during heavy windstorms. It is prudent to set a larger number of grafts than are desired for permanent branches because of the accidents which may happen, and careful attention to the details of good orchard practice in spraying and culture will effect the degree of success attained in top-grafting.

CONSIDERATIONS IN PRUNING APPLE TREES

Essential Factors That Insure Greater Profits for the Orchardist

CLARENCE M. SALLEE, '16, Ohio State University

PRUNING is regarded by orchardists as one of the most important phases in the scientific management of an apple orchard, and every intelligent fruit grower knows that he cannot expect to secure profitable crops unless he practices it.

Pruning is being carried on continually in nature. The natural conditions, however, under which trees grow are not at all suitable to the modern horticulturist, for in nature the trees are close together, with the result that they grow tall in search of sunlight.

In a short period of time the lower branches die because the sunlight has been unable to penetrate through the dense tops, leaving the lower half of the tree incapable of bearing fruit, and of no value except to act as a support for the top. Even if a few of the lower branches should survive these adverse conditions, they would be long, slender and weak. Trees planted under natural conditions, however, receive more sunlight and have a greater abundance of available food material which may so stimulate the annual growth that the tree will grow out of bounds. This is a condition not at all to be desired, so that the orchardist must cut off some of this extra growth, thus making the tree of a more compact and symmetrical form.

Observe a tree that is growing wild and you will notice that it tries to product the maximum number of seeds possible in order that it may propagate the species. Many trees produce their seeds imbedded in flesh parts, which helps in their distribution especially if carried off by animals.

These trees are cultivated by man in order that they may produce more and larger fruit with a minimum number of seeds, as he is not interested in the seed method of propagation for apple trees.

There are wide differences of opinion as to the objects and practices of pruning, but most all successful fruit growers follow some plan for pruning their trees. The grower may have no clear idea as to his plan but in actual practice he will unconsciously prune his trees toward some ideal. Before touching the tree with a saw or pruning knife the progressive fruit grower should stop and consider what should be accomplished by pruning. The different orchard operations of today are carried on with the greatest ease and economy when the trees are small, stocky and within easy reach. This applies to practically all of the work carried on in an orchard and is one of the greatest problems of modern fruit growing. Apple trees are grown for the fruit they will produce and not for the wood ,so it is to the advantage of the fruit grower to prune his trees in such a manner that they will make a stocky growth. This will make the branches strong enough to bear the fruit as it is maturing thus doing away with mechanical supports.

Keep the tree in shape. That means that the tree must be so pruned that one side will not develop more than the other, also keep the tree from growing straight up in the air or from spreading out too much. The strength of the branches will be greater if careful attention is paid to the shaping of the tree.

The vigor of an apple tree may be changed to a remarkable degree by the

proper sort of pruning. Some trees are very vigorous rapid growers, so in this instance it would be desirable to modify the growth to some extent. If not modified all the energy will go in wood formation which will be exceedingly detrimental to the crop of fruit. On the other hand there are trees of another type which make a relatively slow growth, which may be stimulated to further activity by judicious pruning.

The majority of trees bear commercial crops only once in two years. By a commercial crop is meant one that will bring in a good profit at the end of the season, something that will make the marketing of of the apples worth while. This overproduction of fruit one season is probably responsible for the shy bearing the following season. All the energy is consumed in maturing the crop of apples already set, none being left for the formation of fruit buds for the next crop. By thinning out some of this surplus fruit more energy can be put into the formation of both the present crop and the development of fruit buds for the next crop. This thinning is largely accomplished by judicious pruning so that a tree that has been well trimmed will need little hand thinning.

It is a well known fact that fruit spurs are formed only in the presence of sunlight, so under the average conditions the top will be the only part of the tree producing fruit. The lower portion and branches in the center will of course receive no sunlight, due to this dense foliage in the top of the tree. The proper procedure in this case would be to thin out the top branches so that the sunlight may filter down into the center of the tree. Fruit will not color up properly unless it receives a normal amount of sunlight. This fact is very evident, for when a leaf shades the apple this spot will remain green.

Thorough spraying is possible only when the tree has been carefully pruned, all dead wood removed and the branches well within reach. It is possible with the high powered spraying machines now in use to reach to the tops of the highest trees, but the expense of so doing is high. The best policy is to keep the tree headed back so that the uppermost branches will be within easy reach of the ordinary spray rod.

Season to Prune.

The season of the year in which to prune depends upon a number of conditions. As a general rule the winter pruning tends to produce a vigorous wood growth while pruning done in the early summer tends to stimulate the production of fruit buds. The European method of pruning involves the management of the individual fruit spurs which of necessity must be done during the summer months. They often find it necessary to go over the trees three or four times during the summer punching out the new growth and snipping back small shoots.

The American horticulturist should pay more attention to summer pruning, however, the removal of large branches should be done during the early spring months. This summer pruning is best done in the month of June as the active growth will be slow at that period.

Winter pruning is not desirable for a wound made at this time will be subjected to freezing, thawing and the action of the winds throughout the winter. The cambium layer of tissue is exposed to the action of the weather, and conditions will probably be such as to kill it for some distance back between the bark and wood. When spring comes, the wound starts to heal over, but instead of starting at the cut it

has to start considerably below. These bitten wounds are the slowest in healing.

The major part of pruning is done during the spring months, particularly in March and April, in this country. Most of the growers have no convictions as to the effect it has on the tree but prune at this season principally because it is a slack season of the year.

This is a period just before active growth starts, so is the best time to make cuts, as they are not exposed to weather conditions for any length of time. If made early in the winter the wound will be exposed to decay and to the action of disease and fungi. As soon as growth starts the cambium layer begins to cover the wound forming a callus.

After Pruning, This Tree Is in Such a Condition That Spraying is Less Difficult and Will Produce Clean Fruit of High Color

Pruning Young Trees.

The newly set trees should be pruned as quickly as possible. While the tree stood in the nursery row there was a balance between the top and roots, which were just able to supply the moisture and food needed by the leaves. When this tree was dug practically half of the roots were cut off or destroyed, so it is evident that the equilibrium was destroyed. Due to lessened sap pressure some leaves wilted while others not quite as vigorous probably died.

Apple trees should be headed low for it gives greater ease in picking, thinning, pruning and spraying, but not so low that cultivation will be made more difficult. If the first scaffold branch comes out 18 to 24 inches from the ground there will be little difficulty experienced in cultivation with a team.

The form of head decided upon may be either open or of the leader type. In the open form a central leading shoot is not desired so it is cut out, which opens up the top considerably, permitting the entrance of sunlight and air. This system is widely used for the apple and is very satisfactory for most of the varieties. Some people, however, prefer to trim the young trees after the leader method which consists in having the central or main shoot a little longer than the side branches.

There are three things that we must keep in mind when pruning young trees: (1) Choose and space the scaffold branches properly; elect the most vigorous branches pointing in the proper directions and use these as the

main limbs for the tree, all others being cut off. (2) See that these main branches are kept properly dominant. By this is meant that branches of lesser importance should not be allowed to grow too vigorously, thus crowding out the main limbs. (3) Avoid sharp-angled crotches for they are sure to cause damage at the end of the season. When any strain is placed upon the limb it is sure to break off. Such a condition would happen during a heavy wind storm or when laden with fruit at time of maturity.

Large Apple Tree Before Pruning, Too Many Lateral Branches Making Spraying Difficult and Tending to Decrease Color

During the first few years of a tree's life it may be profitable to pick off all blossoms as the act of bearing fruit is sure to stunt the growth. Generally the wood growth is quite rapid during this period, but if for any reason it is not, then the proper method of procedure would be to prune the tree severely during the spring. thus simulating growth.

Pruning the Bearing Tree.

After the tree has reached the bearing age increased wood growth is not to be desired to such an extent as it was during the first few years. The pruning should be done so that energy will be turned into fruit production. Before pruning it is necessary to study each variety and individual tree for there are wide variations in habits of growth.

Dressings for Tree Wounds.

Wounds of any size are slow to heal over and so should receive careful attention, for frequently decay or disease sets in before the callus has had time to form. All wounds of more than half an inch in diameter should have some dressing applied to prevent decay. A dressing has no value whatever as a healing agent, but is simply placed there to give the wound protection. Many dressings are known to injure the cambium layer, thus preventing the formation of the callus, especially those containing some of the tar products. For the best purposes the dressing should be somewhat elastic to prevent cracking and also antiseptic to kill any disease or fungi already present in the wound. A paint made of raw linseed oil and white lead has been found to give the most satisfactory results. It should contain just enough oil to make it spread easily and may be applied within a week or ten days after the cut is made.

SAVING THE ORCHARD BY SPRAYING

How Insects and Diseases Are Controlled by Chemicals

DONNELL D. LEYDA, '16, Ohio State University

Fruit growing as a commercial proposition met with its greatest boom where an effective means of controlling the insect pests and diseases affecting the various orchard crops was discovered. Through the discovery of Paris green in controlling the potato beetle, in 1876, it was suggested this chemical would be effective in controlling the canker worm. Not long afterward New York orchardists found at harvest time that the damage by the codling moth had been materially reduced. At first the fruit growers were skeptical of the means of preventing worminess, so that up until 1885 the practice had been experimental.

The practice of spraying to control fungi originated among the vineyardists of Bordeaux, France, who wished to protect their vines from the downy mildew, a disease which had been introduced from America. The effectiveness of preventing fungous troubles was quickly taken up by the United States department of agriculture and the state experiment stations which have brought it up to its present efficiency.

Spraying is a secondary operation and should be conducted with proper tillage, fertilization and pruning to get the best results. Unless insects or fungus troubles are present, there is no occasion for the operation; but inasmuch as these enemies are always troublesome, and as no one can definitely tell whether they are absent or not, spraying is an insurance. The risk is too great to allow the practice to be omitted for a single season. So many growers have refused to spray, or spray in an efficient manner, that the plant insects and diseases have been increasing each year in all fruit sections so every fruit grower now realizes the real insurance value of spraying.

There are two distinct groups of spraying materials; insecticides, used for the control of insects, and fungicides for controlling fungus diseases. The insecticides are divided into (1) food poisons, (2) contact poisons, and (3) suffocating poisons. The use of these poisons depends on the kind of insect doing the damage, so that for effective use of any insecticide, the habit of the insect, and the stage of its life it is most easily reached with the poison should be determined.

Food poisons are composed of material which must be eaten by the insect as it chews the foliage or fruits of plants. Of these materials. compounds containing arsenic, such as Paris green and lead arsenate, and are applied for the codling moth, canker worm and curculio. The applications may be in water, as a dry powder or mixed with some substance serving as a bait.

Contact sprays are applied to destroy insects which get their nourishment by inserting the beak into the plants and sucking the plant juice. Plant lice and scales belong to this group of insects, but cannot be reached by poisons on the foliage. These sprays are caustic and penetrating, and kill by coming in contact with the bodies of the insects.

Suffocating poisons consist of gases, such as carbon bisulphide, hydrocyanic acid gas, and tobacco fumes. These poisons are used in connection with greenhouses where the plants cannot be sprayed with either a contact or food poison.

Fungi constitute a group of plants lacking the green coloring matter common in all cultivated plants. The fungi plants are unable to digest for themselves the crude food materials available in the soil and air, and must get their food from other plants. Therefore some living on green plants, cause fungus diseases which may destroy the entire host plant. The most common of these diseases are mildews, leaf spots, cankers, fruit rots, scabs and rusts. It is impossible to reach them after they have once entered the host; therefore, preventative measures must be undertaken to keep the plants in a vigorous and sanitary condition which will reduce the possibility of their becoming infected with the parasite. This can be done by spraying with some fungicide which will prevent the fungus from gaining entrance. either by killing the spores or preventing their germination. Prevention is the best cure and it is best to keep the orchard clean as possible by removing all rubbish and weeds which may serve as a winter hiding place for insects and fungus spores. The common fungicides are Bordeaux mixture and lime-sulphur.

The time to apply the sprays will vary with the locality, although the general spray schedule as given below should be effective.

The clean up or dormant spray should be applied during the latter part of March or up until the time the buds open in the spring. For the dormant spray lime-sulphate is used—one gallon of the concentrated solution to six or seven gallons of water. This spray will destroy the San Jose scale, oyster shell scale, scurvy scale and blister mite. In applying every part of the tree should be covered so that none of the insects escape. Thoroughness is the keynote of success in spraying.

The second spray should be applied about the time the blossom buds begin to show pink. For this spray use full

The Result of Careful Spraying

strength Bordeaux, the proportion being 4 pounds of copper-sulphate, 4 pounds of fresh lump-lime to 50 gallons of water. To make this solution dissolve the copper-sulphate and slake the lime in part of the water. When the lime has all slaked to a fine powder and the copper-sulphate is thoroughly dissolved, dilute each of them with half of the remaining volume of water. Then pour them together, stirring constantly. A more convenient method is to dilute the materials in the suitable tanks and run them together at the same time into the spray tank. In order to make the spray more effective three pounds of arsenate of lead to every 50 gallons of water should be added to the solution. It will kill bud moth, canker worms and case bearers.

The third spraying should be given as soon as the petals have falen and before the calyxes have closed. Commercial lime-sulphur solution properly diluted to summer strength or about 1¼ gallons of the concentrated lime-sulphur solution to 50 gallons of water. Three pounds of arsenate of lead should be added to every 50 gallons of the spray solution. This is above all the most important spray of the season. To destroy the codling moth the poison must be forced into the calyx cups before they close. This spray will also help to check the scab.

The fourth spray is the same as the third and should be applied about ten days later.

The fifth is the same as the third and fourth and is applied as a preventative against the various fungus attacks. It also destroys the larvae of the scale insects.

The sixth and last spray should be made some time during the first part of August with full strength Bordeaux (4-4-50) and 2 pounds arsenate of lead to every 50 gallons of solution.

Modifications of the spray schedule may be worked out, and some growers substitute lime-sulphur for a summer spray in the place of Bordeaux although it must be diluted 1-40 and the lead arsenate added in the same proportion as given above.

Profits From Spraying.

Fruit growers who practice spraying from year to year seldom realize how great their profits are from spraying. The following experiment will show the difference in profit between the sprayed and unsprayed plots.

The experimental plot consisted of a block of Ben Davis trees about 20 to 25

RESULTS OF SPRAYING

Variety	Treatment	Percentage insect, disease and spray injury.					Spray Injury (Russeting)	Percentage of sound unblemished fruit
		Worms	Curculio	Scab	Cedar rust	Rots		
Ben Davis	Sprayed	0.6	0.5	4.3	0	0.6	1.3	91.9
	Check, unsprayed	5.2	2.5	84.3	0	22.0	.....	5.2

years of age. No cultivation had been given for two years but the trees were in a fair state of vigor. Thirty-six trees were sprayed, and the applications were made as follows:

April 17—Lime-sulphur 2-50.

May 6—Lime-sulphur 1½-50 plus 3 pounds arsenate lead.

May 26—Lime-sulphur 1½-50 plus 2 pounds arsenate of lead.

Notes were taken in the summer after the "June drop" was over which showed the following results up to July 3.

The greatest amount of injury from a single cause, on the unsprayed trees was the scab and it was estimated that 84.3 per cent. of the fruit was affected while, on the sprayed trees there was only 4.3 per cent. of scab. From these figures it would show that a rather severe outbreak of apple scab was effectively controlled. The fruit was harvested in October and careful counts made from the sprayed and unsprayed trees. The results are given in the following table:

The cost of spraying this orchard three times was as follows, per tree: Material, 20 cents; labor 8½ cents; total 28½ cents, or $17.10 per acre; The profits due to spraying were $25.20 per acre.

HARVESTING DATA

Variety	Treatment	Percentage of insect, disease and spray injury.						Marketable fruit per tree	Value of fruit per acre
		Worms	Curculio	Scab	Rots	Cedar rust	Spray Injury		
Ben Davis	Sprayed	12.2	10.0	21.2	18.3	0.8	12.6	¾ bu. No. 1 1¼ bu. No. 1 ⅜ bu. culls	$47.70
	Check, unsprayed	29.0	30.1	78.0	40.0	0.0	....	⅝ bu. culls	$5.40

COOPERATION FOR THE NURSERYMEN AND PLANTER

How the Grower Can Secure the Best at Reasonable Prices

W. B. COLE, Painesville, Ohio

THE farmer should exercise the same care and judgment in the purchasing of trees as in the buying of land, farm implements or livestock. He should seek to know as much as possible about the thing to be purchased and the average market price for the same. So the purchaser of nursery stock should have a general idea of how nursery stock is grown, handled and marketed, as a protection against the extravagant claims of unscrupulous dealers and as a help in the selection of the best grades and varieties suitable to his needs.

All growers are working along about the same lines and using the same methods, so that any differences in their products can be attributed to location. soil, climate or to the personality of the grower. Everyone has observed the varying results on farms in the same locality and it is reasonable to suppose that there should be the same conditions to contend with in the nursery.

It is best for the planter to deal with the nearest nursery, as it admits of a personal acquaintance, which is always advantageous and is also a saving of time in transit and in freight charges, and where it is possible to drive to the nursery a saving also in boxing or baling. This is not always possible, and too much stress should not be placed on these advantages. as nursery stock is shipped hundreds of miles and is often weeks on the road, and is yet delivered in perfect condition. In long distance shipments it is essential, of course. that shipments be started early, so as to arrive in proper time for planting. Very often the better quality of stock or lower prices offered in a strictly nursery section will outweigh any possible advantage of dealing with the local nurseryman, who may be handicapped with unfavorable soil or climatic conditions.

It is essential that nurseries be located where there are a variety of soils. Moist, but well drained, sandy loam is best for rooting cuttings; gravelly loam for producing a strong, fibrous root system, so desirable for small fruit plants. while porous or well drained clay soil is preferable for pear and some other fruit trees.

The effect of climate upon the production of nursery stock is something not fully understood. What little is known has been learned by experience. Nurseries have continued to exist and multiply in sections where the growing of nursery stock has been successful, and have been discontinued in places where frost and winter inury and other conditions have rendered the growth of nursery stock unprofitable. Just why certain trees or plants will stand more cold some years than others, or will be injured more in some sections than in others in the same latitude and with the same temperature, is hard to explain. It is quite certain, however, that elevation, proximity to large bodies of water, snow protection, sunshine (especially in winter) all have their effect upon the hardiness of plants. If a straight line be drawn from Boston to Chicago, it will be found that nearly all of the nurseries of the east and north are located within one hundred miles from this line.

Methods of growing fruit trees are practically the same with all nurserymen in the district referred to. The pear, cherry, plum and quince stocks are imported from France in the winter, planted in April and budded the follow-

ing August or September. Apple seedlings are either imported or purchased of western growers, who make a specialty of growing apples from seed. These are either crown or root grafted, or planted and budded the same as other fruit stocks. Peach trees are grown from seed sown in drills and budded the first summer. Black and purple raspberries are grown from tips layered in August and September and marketed the same fall or the following spring. If the tip plants are not sold they are often planted out and then offered as transplanted year stock. Red raspberries are sucker or volunteer plants from the parent stock. They should be about the size of a lead pencil and should be carefully dug so as to preserve a small piece of the cross or lateral root. Blackberries are either sucker plants or root cutting plants. The root cutting plants are produced by planting pieces of roots two or three inches long in drills and growing them for one year. They are preferred to sucker plants and command a larger price, owing to the fact that they have a better root system.

The American Association of Nurserymen has suggested standard sizes or grades of nursery stock, which are now generally accepted by nurserymen. The standard sizes in fruit trees are:

Apples, Pears. Plums, Cherries—2 or 3 years, first size, 11-16 inch caliper and up; 2 or 3 years, second size, 5/8 to 11-16 inch caliper; 2 or 3 years, third size, 1/2 to 5/8 inch caliper.

Peach—1 year, first size, 9-16 inch caliper and up, 4 to 6 feet; 1 year, second size, 7-16 to 9-16 inch caliper, 3 to 4 feet; 1 year, third size, 5-16 to 7-16 inch caliper, 2 to 3 feet.

Grape vines, gooseberries and currants are made in two grades and called either No. 1 or No. 2, or else 2 years and 1 year, the second size two years, being usually listed as one year. Some nurserymen make a practice of digging grapes and currants at one year, selling the larger plants and resetting the smaller ones and growing them for another year. Except in years of scarcity or when there is an exceptionally strong growth at one year, this practice has generally been considered of no special advantage and as incurring unnecessary labor.

It will be seen that the method of grading fruit trees by caliper is simply a matter of measurement and insures a uniform grade to the purchaser. The terms No. 1, No. 2 and No. 3 should always refer to size only and not to quality. There should be only one standard of quality, and that is the best, with all diseases, mutilated, poorly rooted or badly crooked trees discarded. The lighter grades should be just as carefully selected in this respect as the first size. Neither can the smaller grades be rightfully considered stunted in growth, as it is found that when placed in the orchard they produce, with proper care, satisfactory results.

It devolves upon the nurseryman to use the best means in placing his products with the planter. Nursery sales are made through agents, dealers or catalogues. The latter method should be the most economical and best for both the nurseryman and planter. While there are many honest dealers, it is possible for dealers of all shades of honesty or dishonesty to buy of reputable nurseries and overcharge and mislabel in delivering to his customers. Some nurserymen sell exclusively by catalogue; others through agents, but rarely ever does the same nursery use both methods of selling, except as they may have an agency department under a separate name. The reason for this is apparent when we consider the expense of selling through agents, to-

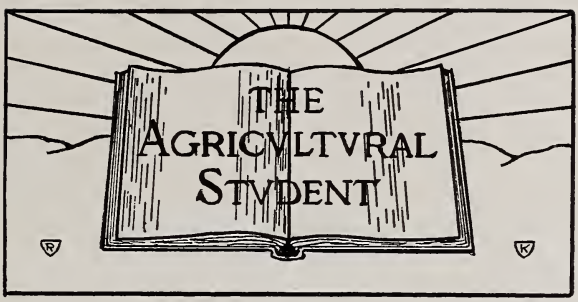
gether with the high prices necessary to charge, as compared with the low prices quoted in catalogues. This can be readily understood when we consider that the commission paid agents is 35 to 40 percent for selling and 10 to 15 percent for delivering and collecting. As 80 percent is about the average amount collected on agents' sales, it will be noted by the following statement that the nurseryman receives only about 30 cents on $1.00 for sales made, or in other words, a tree costing the planter one dollar could be delivered for 30 cents if agent's commission and bad debts could be eliminated:

Commission to agent	$ .35
Commission for delivering and collecting	.15
Loss through poor accounts	.20
Returned to nurseryman	.30
Cost to planter	$1.00

Thus for 30 cents the nurseryman has grown and furnished the tree, furnished money in advanced commission, maintained an office force for correspondence and copying orders, filled and packed the orders and paid freight to destination. It is hardly to be expected that the cost of selling through catalogues would have been greater in the matter of office work or packing orders, and there would be a saving of freight charges to the nurseryman, which, in catalogue business, is always paid by the purchaser. The loss from poor accounts from catalogue sales is a small matter, as all parties not responsible pay cash before shipment. These advantages place the catalogue nurseryman in position to make much lower prices on the same margin of profit. The planter is not only securing lower prices, but has the advantage of dealing direct with the nurseryman and the assurance that his order has not passed through any irresponsible hands.

As packing charges and local freight adds considerable to the cost of nursery stock, fruit growers can often obtain lower rates by sending in club orders or ordering as fruit associations. Where their orders are large enough, stock can be packed in bulk and shipped in carload lots to some central point for delivery.

The planter should entertain a friendly and reasonable attitude toward the nurseryman. He should understand the risk of transplanting, which in some kinds of fruit trees, notably the sweet cherry, is considerable, and if stock is delivered in good condition, be willing to assume this risk. He should be able to detect whether stock is in proper condition upon arrival, and if not should report the matter and adjust it with the nurseryman at that time. He should understand the necessity of nurserymen relying upon fruit growers for scions and buds, and upon other nurserymen for shortages, and upon hired help for staking and labeling trees, both in growing and shipping, where mistaken identity or misplaced label may not be discovered for several years. The planter should place a most reasonable and charitable construction upon mistakes of this kind. The guarantee to refund the amount paid for stock that proves untrue to name is sufficient penalty to insure careful and painstaking effort on the part of the nurserymen. In the best conducted nurseries the chances of error are altogether too great to assume a greater risk. For the planter to demand several dollars damages for a tree not true to name, that was bought for a few cents, will have a tendency to higher prices, or else will force the nurseryman to sell through irresponsible agents or dealers to avoid personal risk.



OF

OHIO STATE UNIVERSITY.

A MEDIUM FOR EXCHANGE OF IDEAS BETWEEN COLLEGE AND FARM

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COLUMBUS, OHIO, MARCH, 1916.

EDITORIAL

THE ISSUE.

Following the policy of the staff in former years, the March issue of The Student has been devoted entirely to horticulture, the work of securing and selecting manuscripts being done by the horticultural member of the staff, Isaac P. Lewis, a senior, who has been employed by the Ohio Agricultural Experiment Station for several seasons.

The article by F. H. Ballou of the Ohio station is based upon the results of experiments conducted in the apple orchards of southern Ohio counties, and gives a clear insight into the possibilities of rejuvenating old trees. Perhaps no other factor is so important in the practicing of orcharding. When just a few cents expended for fertilizer which not only produces the materials for mulch, but also an increase in the yield of fruit, the possibilities of apple production is given a worthy stimulus.

That the results are satisfactory and practicable in every sense is shown by the fact that many of the southern Ohio orchardists have quickly adopted the plan, which is bringing dollars into their pockets. Where dilapidated and abandoned orchards were formerly seen are now heavily bearing trees, with the atmosphere of prosperity, good care and management. Apple production has been rendered to a point where they are cheaper per bushel and finer in quality just because one man began to determine things for himself.

Many farmers, even in the livestock and grain growing sections, have old orchards filled with trees which hardly are worth their keep for fruit production. These, with a few days' care each year, would produce more profits than from several acres of corn, wheat or alfalfa. In addition, the satisfaction of having delicious fruit in the cellar is worth several times the amount spent for producing it.

HORTICULTURAL TENDENCIES

Horticulture has frequently been spoken of as a branch of agriculture which has been developed after years of soil cultivation and extensive farming. It would seem that the industry was the result of a desire for intensive farming. Yet during the past few years a different idea has been brought forth.

Instead of being secondary to agriculture, it can be regarded as primary in certain senses. In the past many have inherited their land and simply continue the practices of their fathers and mothers. But with the increase of population and the rise of land values it is difficult for all to begin an extensive system of farming, while with a few acres intensive culture can be easily and profitably practiced.

Horticulture is a stepping stone for the city man to begin a life in agriculture. Many of the prominent intensive culturists now point with pride to the time when they were "back-yard" farmers. Even a portion of a lot has been known to reduce the cost of living for the family as much as $100 per year. In addition, the fruit and produce has been relished much more. "I grew these vegetables in my own garden," gives greater satisfaction than "We get them shipped to us."

The progress made in horticulture and the introduction of the greenhouse, the canning plant and the cold storage has placed the business upon a high rank. Rising land values always accompany the development of "glass land," and many are making more from an acre under glass than others with 100 acres under an extensive system.

HENRY WALLACE

"Good farming, clear thinking, and right living was the motto of Henry Wallace, the editor of 'Wallaces' Farmer, who died February 22, 1916. Mr. Wallace began his life work as a minister, but failing health made it necessary for him to seek the farm, where an outdoor life could be followed. In 1895, with his sons, he started Wallaces' Farmer, which has been a worthy exponent for practical farming and community development.

That his work as a farm editor was influential in the development of better agriculture is shown by the fact that he could speak through his columns with genuine philosophy, uprightness and sincerity and move the rural population. His ability lay in the power to stamp his high ideals upon the reading public without a touch of unkindness or mistrust.

He has been an inspiration to thousands of men. His big heartedness and broad mind made a lasting impression, while the same atmosphere was transmitted through his writings. Doctor Wallace wrote his editorials as if he were addressing his congregation. His readers were his audience.

He has had an unchanging creed, which meant honesty in every-day affairs, decency and cleanliness in the home, obedience to the laws of God and man and an ambition for right living. His example of publishing a clean paper in regard to advertising has been

of the greatest value toward better ethics and more honesty in the advertising world.

Such has been the record of a man who chose the farm paper as a medium for preaching the gospel of better farming. His appreciation of the value of publicity to gain advantage for the causes he represented led him to the consciousness of the fact that he influenced the minds of his readers to a greater extent than any other factor in agricultural education.

TOWNSHEND AGRICULTURAL SOCIETY

Believing that the two societies overlap in function and wishing to concentrate their activities into one organization, plans have been started to combine Townshend Literary and the Agricultural Society into a Townshend-Agricultural Society, which will meet and hold meetings after the fashion of the present Townshend Society. Under the new management it is proposed to make The Agricultural Student the official organ of the new organization.

With regard to the consolidation of the two societies it is probable that a greater unification of efforts could be secured, however, the membership of both societies is composed of practically the same persons. To secure a large membership for a literary society will in a measure destroy its efficiency, for a live society depends upon the frequent appearance of all members upon the program.

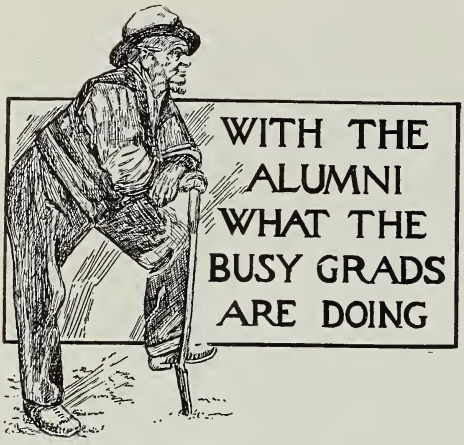
The plan of making The Agricultural Student the official organ of the proposed society is, however, beyond the conception of the organization, for it cannot train staff members along agricultural journalism; it would, however, fulfill its mission by offering practical experience in public speaking.

The best interests for The Student would be secured when a board of control, composed of the editor and business manager and faculty members were appointed, which would have the power of grading staff members upon the basis of work done and ability displayed. Agricultural writing is in itself an activity aside from any other in the college; hence the impracticability of even believing the activity could be enhanced by a literary society control.

The plan does not intimate that The Student should be taken over by a department in the University and managed similar to The Daily Lantern, yet the use of The Student as a laboratory medium for a course in agricultural journalism would be possible at all times.

It is amusing to think of some of the propositions brought forth regarding the management of The Student by members of the societies who never have been connected intimately with the work of the publication, yet at the eleventh hour pose as editorial experts. The idea of training along journalistic lines has been hooted at by students whose own writing carries with it about as much logic as would be found in assuming that an egg should have feathers.

The work of The Student is not the outgrowth of a society nor should it be in any manner accountable to an organization which may change its policies each semester. On the other hand, a board of control or managership composed of individuals who have the idea of The Student at heart would relieve the proposed society from electing an editor and business manager each year whom the organization has no means of measuring from a journalistic standpoint.



O. M. Kile, '13, formerly editor of publications at the West Virginia Agricultural Experiment Station at Morgantown, is now in charge of the eastern division of the Soil Improvement Committee, with headquarters at Baltimore, Maryland. Mr. Kile was editor of The Agricultural Student during the year 1912-13.

Charles E. Snyder, '09, is now editor of the Farmers' Review, which is published at Chicago. He was formerly assistant editor of the National Stockman and Farmer, published at Pittsburg, Pa.

V. A. Place, '12, writes "That for two days, Wednesday and Thursday, February 16 and 17, 900 farmers and their wives met three times each day at Wabash, Indiana, in a farmers' round-up, which was held under the auspices of the Wabash Commercial Club. Entertainment was furnished and moving pictures of an educational nature were shown. Films showing the farm tractor demonstrations at Bloomington, Illinois, construction of concrete silos and methods of treating grain for smut convinced even the most skeptical about the benefits that may be derived from the use of modern methods. In all the meetings it was emphasized that methods make more difference than price when it comes to making profits."

Mr. Place is the Wabash county agent and through his efforts the farmers are obtaining many benefits. It was through several weeks of careful preparation on his part that the big "round-up" was made possible.

Robert R. Barker, '16, is employed as soil chemist in the department of agronomy at the Ohio Agricultural Experiment Station at Wooster. He completed his work the first semester and will return at commencement time to receive his degree.

Professor and Mrs. Frederick W. Ives announce the birth of a son, John Warren, on February 20. Mr. Ives is a professor in the department of agricultural engineering. Mrs. Ives was graduated in 1915 from the home economics department.

L. L. Heller, '12, is with the bureau of animal husbandry, United States Department of Agriculture, Washington, D. C. He is working on sheep and goats.

Charles M. Fritz, '12, is working in the department of animal nutrition at the Ohio Agricultural Experiment Station, Wooster.

C. C. Engle, '12, is doing work in soils at the University of Cornell at Ithaca, New York.

Thaddeus H. Parks, '09, has been selected as entomologist for the extension department of the Kansas State College of Agriculture. He was formerly connected with the bureau of entomology in the United States Department of Agriculture, but later held a position in the Idaho Experiment Station.

Glen L. Smith, '15, and Miss Melba Hegler of Good Hope, Ohio, were married on February 6 at Newport, Ky. After spending their honeymoon with relatives in Cincinnati, London and Columbus, they will live on a farm near Austin, Ohio.

Kenneth C. Marsh, short course '15, is located on a dairy farm at Mantua, Ohio.

I. W. Beerbower, '15, is farming at Hicksville, Ohio.

Guy Kesler, '15, has accepted a position as a landscape architect in Toledo.

Bernard R. Higley, '15, is farming near Middleport, Ohio.

Lyman M. Silver is farming at Waynesville, Ohio.

Edward H. Root, ex-'16, and Miss Lola Wagoner were married on February 12 at Stony Ridge, Ohio. They will reside on a farm near LeMoyne, Ohio.

William S. Davis, '15, is connected with the agricultural department of the Chamber of Commerce at Cincinnati.

Francis L. Allen, '06, is a farmer at Van Wert, Ohio.

Frank D. Heckathorn, '07, is nursery and orchard inspector for Ohio, with headquarters at Painesville.

William A. Martin, '05, is farming at Kenton, Ohio.

Burton L. West, '06, is advertising manager for the Cussins & Fearn Wholesale Hardware Company, in Columbus.

John O. Williams, '08, is now in the department of animal husbandry at Clemson College, South Carolina. Since his graduation he has been scientific assistant in animal husbandry, U. S. Department of Agriculture, Washington, D. C., and expert in charge of the Colorado Breeding Station at Fort Collins.

George T. Snyder, '06, is a livestock farmer at Monroeville, Ohio. He is making sheep raising a specialty.

Emerson S. Poston, '05, is farming at Logan, Hocking County, Ohio.

William L. Slate, '09, is now professor of agronomy in the Connecticut Agricultural College and agronomist at Storrs Experiment Stations, Storrs, Conn. Since graduation, Mr. Slate has been an instructor in the agronomy departments of the Universities of New Hampshire and Maine.

James V. Hyatt, '05, is farming at Norwich, Kansas.

Harvey W. Smith, ex-'09, is with the Maxwell Auto Company in Columbus.

Charles E. Johnson, ex-'09, is a livestock farmer at Flushing, Ohio.

Leo B. Ransom, ex-'09, is farming at Champaign, Illinois.

Herbert R. Watts, '10, is assistant entomologist at the Tennessee Agricultural Experiment Station at Knoxville.

Ralph W. Munger, '07, is farming at Xenia, Ohio.

Frank N. Fagin, '10, is in the horticultural department at the Pennsylvania State College, State College, Pennsylvania.

Karl J. Hopp, '14, is teaching agriculture in the township high school at Hutsonville, Ill. On June 1 he was married to Ethel Deming of Newark, Ohio, a graduate of Denison University.

William S. Bauchmiller, '14, is at the head of the agricultural extension department of the schools of Preston, Minn. Mr. Bauchmiller started the department last year and this year he was placed in charge of it.

Ralph Q. Smith, '14, has accepted a position on the teaching force of the New York State College of Agriculture at Alfred, N. Y.

Benamin Repp, '14, has charge of the work in agriculture and manual training in the high school at Sylvania, Ohio. In addition to his regular duties he has been assisting the district superintendent in holding community meetings at various places throughout one of the districts of Lucas County. His part is to take up some phase of agriculture and discuss it.

Don C. Mote, '12, entomologist for the department of animal husbandry at the Ohio Experiment Station at Wooster, is on leave of absence so that he can work on his doctor's degree at Ohio State University. He is specializing in animal parasites. He received his Master's degree in 1915.

RAY FIFE, '17.

An added impetus will be given to the boys' and girls' club work of the state by the appointment of W. H. Palmer of Ohio State University as state leader. Mr. Palmer has been in close touch with the club work of the state, having been in immediate charge of the stock judging contests, which were a prominent feature of many county fairs in 1915. The scope of the club work will be extended to include many other forms of club work for boys and home-making contests for girls. It will be the aim of the state leader to cooperate heartily with the county and district superintendents and the teachers of agriculture and home economics. No better laboratory can be found for classes in agriculture and home economics than in carefully planned and carefully supervised boys' and girls' club work. Many county and district superintendents will give school credit for the work. Circulars explaining the various clubs can be secured by addressing State Leader Boys' and Girls' Clubs, Ohio State University, Columbus, Ohio.

TO make high school agriculture a vital element in the activities of the rural community is a problem that superintendents and teachers can no longer ignore. Teaching this subject merely as a cultural study by the common categorical question and answer method foredooms inspirational results and limits its influence to the atmosphere of the classroom. To be effective this study must correlate directly with the work of the farm. Recitations must be largely based upon discussions of farm problems. There is no good reason why high school agriculture should not be a constructive force pointing out new and better ways of doing things on the farm. When it does this then teachers of this subject can claim the respectful attention of farmers. But so long as they are in the Dark Ages in agricultural instruction, with so many pages of text book work per day, with so much mechanical routine and so many minutes of recitation, etc., teachers deserve the shameful indifference with which the work is accepted.

This is dealing with generalities. To make agriculture useful to the community requires detailed work and thought. An experience that tended to motivate the subect of high school agriculture and make it a useful economic factor in the community was carried out by the Union Township high school, Hancock County, Ohio, last year.

The agriculture class of the high school purchased a Holden corn tester, No. 2, with a capacity for testing four hundred ears of corn at one time. By public auuoncements and signs farmers were invited to bring in their seed corn for germination tests. To cover expenses and pay for the tester, a charge of $1.00 was made for testing four hundred ears. As was expected, some men were skeptical about the merits of the tester, some were indifferent, some said they could tell a good seed ear without testing, while others were glad of the opportunity to eliminate bad seed ears.

In making the tests, the class divided all ears tested into three groups, name-

ly: First class ears, or those from which all kernels tested produced strong, vigorous sprouts; second class, or those in which there would be one or possibly two weak sprouts, all other sprouts being vigorous; third class, or all those below the minimum requirements for the second. Third class ears were discarded, being unfit for seed.

A record was kept of each test and, so far as possible, reports were obtained from farmers as to whether the tests paid. If, in their judgment, they did, it was believed that this activity must be of some economic importance to the community, as well as educational to the boys making the tests.

A few of the reports received may be of interest. Mr. A tested 400 ears; among these 349 were first class, 40 second class and 11 third class. Mr. A's corn was small and well matured, consequently it tested especially high. He reported nearly a perfect stand of corn. Mr. B tested 400 ears. He had 198 first class ears, 69 second class and 139 third class. This corn was large and not well matured, hence he had a large percentage that was unfit for seed. Nine acres were planted with the first class seed, Mr. B reported, which required only a handful of corn to replant where the stalks were missing. Mr. B planted twenty-five acres with untested seed. In this field there was a very poor stand. These reports are typical of all received.

Some interesting germination tests can be made with the tester. Recently the boys were requested to pick out one ear of corn with good seed characteristics and one with poor seed characteristics. The tests made show that there may be boarders in our corn cribs as well as in our barns. The following is the result of one test: 360 kernels were tested from a good ear; 252 were first class, 53 medium and 55 worthless. 240 kernels were tested from the poor ear; 28 were first class, 122 medium and 90 worthless.

Among other school activities in agriculture that can be made as dynamic and vital to the community as germination work, are farm management, feeds and feeding and soil studies. These are constructive, cultural and each involve living issues of rural life.

Is there any reason why farm boys should not work out feeding rations for farm animals and actually test the efficiency of their standards Why should not exhibits of feeding standards and soil tests be made by agricultural classes at farmers' institutes and grange meetings? This is the kind of work that is needed.

The subect of agriculture will be vitalized. The school and the community will have found the common basis for that kind of cooperation that is mutually helpful, and boys and girls will learn the fundamental lesson of citizenship—social service.—M. B. May, Mt. Cory, Ohio.

NEWS NOTES

GRANGE.

By conferring the third and fourth degrees on a class of 283 candidates, the largest number ever initiated at one time by any grange in the United States, the University Grange broke all previous records by 103, the largest previous record being 180. This gives to Ohio two national records within two months, as in January the State Grange made a net gain of over 9000, the greatest of any state in the Union.

The degree work was given by Madison Grange of Canal Winchester, in a perfect and impressive manner in the gymnasium. The work was witnessed by the officers of the State Grange, the secretary of the National Grange and hundreds of patrons from all parts of the state.

At a banquet which followed addresses were made by Master of the State Grange L. J. Taber, Dean Alfred Vivian of the Agricultural College, T. D. Phillips, Master of University Grange, and Renick W. Dunlap, Secretary of the State Board of Agriculture.

State Master Taber of Barnesville said: "Achievement is not accidental. Successful efforts are the result of successful planning, painstaking work, plus some inspiration and much perspiration. Work is the genius of success. The record of this grange is unique, as it was one of the first to be organized in an agricultural college. It started under auspicious circumstances, the leadership of former Dean Homer C. Price. Your first officers were installed and instructed by Governor Batchelder of New Hampshire, the Master of the National Grange. While never as large as it should have been, this grange has exerted its influence on the agriculture of the state. You now become not only the strongest grange in any agricultural college in the nation, not only the strongest fraternity on this campus, not only the strongest numerically of any grange in Ohio, but you have broken all previous records for the largest class ever initiated into a working grange."

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The report of the state highway commissioner for 1915 shows that the department supervised during the year the construction of 843 miles of roads at a total cost of $10,514,797.67, 226 miles being brick, 159 miles concrete, 448 miles macadam and 10 miles simply grading. During the year the department also repaired 905 miles at a cost of $804,753.22. This makes the cost of road repair $889 per mile. This repair work includes a number of stretches of road that were so nearly worn out that the cost was practically as much as reconstruction. The cost on the roads that might be fairly called repair and maintenance was $254 per mile.

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Dexter N. Lutz, senior agriculture, left on February 9 for Fiske University, Nashville, Tennessee, where he became head of the department of botany. Mr. Lutz expects to return to Ohio State next June, if satisfactory arrangements can be made while at Fiske University, otherwise he will complete his course in the summer session this year. He was a member of the editorial staff of The Agricultural Student.

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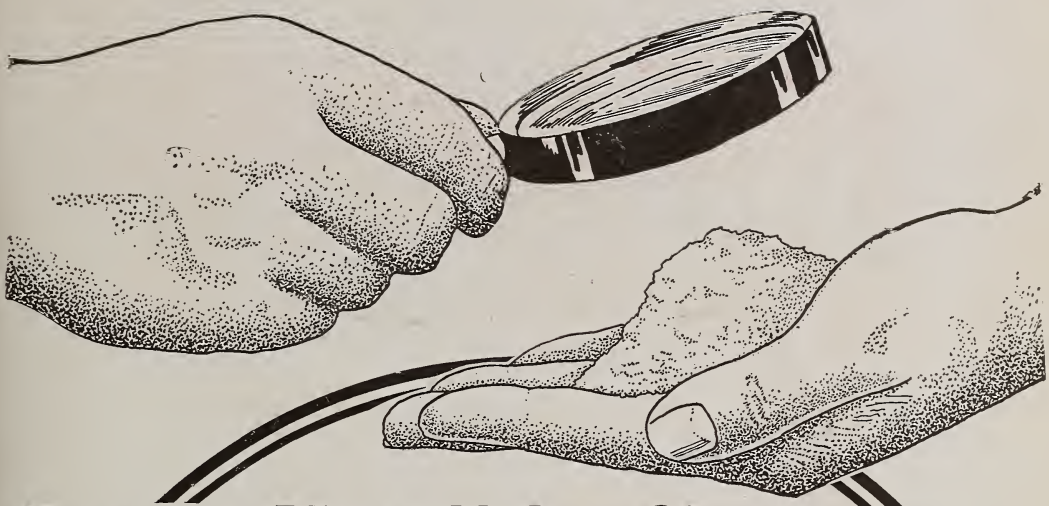
To determine the effect of various grasses on succeeding crops, H. Wayne Palmer, graduate student in soil chemistry and field crops, is conducting a series of tests with 17 species of grasses on 102 plots in the horticultural greenhouse. So far as has been ascertained these are the first experiments to be conducted along this line.



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